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MARKING PORCELAIN AND SILICA CRUCIBLES, ETC.

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INTRODUCTION.

In the analytical laboratory there often is occasion to put permanent distinguishing marks upon crucibles, etc., which will stand ignition and mild treatment with acids and alkalis. The blue pencil or the brush and china paints which are frequently used for this purpose, the markings being burned in, often give results so crude as to be quite unsatisfactory, especially for articles that are before one's eyes daily for years. Moreover, the blue-pencil marks and many china colors lack permanence, and when applied to silica wares do not adhere satisfactorily. The writer has worked out two methods, one for marking with platinum and the other for the application of china paints, both by the use of rubber type.

THE PLATINUM PROCESS.

The crucibles are cleaned by heating for half an hour with nitric acid, one part concentrated acid to one part of water. A sizing is prepared consisting of a hot 5 per cent solution of gelatin. The parts of the crucibles to be marked are dipped into this sizing and set aside to drain and dry. When the gelatin is dry, the desired number is stamped on with a solution of platinic chlorid containing 12 to 15 per cent of platinum—i. e., about 32 to 40 per cent of the hydrated crystallized chloroplatinic acid. The pad holding the solution may be made of six or eight folds of smooth linen or muslin and need not be much larger than the type used. This pad is nearly saturated with a few drops of the platinic-chlorid solution. Too

much of the solution causes blurring and too little of it or too dilute a solution results in dim numbers. After the numbers are dry the crucibles are gently heated until the platinum is reduced and the gelatin burned off. This is most conveniently accomplished in a muffle. Finally, the numbers are heated for one-half minute in the flame of the blast lamp—i. e., for one-half minute from the time it attains the temperature of the flame.

If the wares are cleaned and fired as directed, the markings adhere well. The figures become more prominent if burnished by use of a china painter's burnishing stone, if available, or of seashore sand, or less advantageously of a silica soap. The deposit is resistant to single acids, but not to alkalis. In some experiments library paste was substituted with good results for the gelatin sizing. Gold and mixtures of gold and platinum solutions may be applied similarly, but there is more danger of volatilizing the gold chlorid before reduction takes place, and thereby causing a spreading of the deposit. The resulting figures also are less conspicuous than when platinum is used. This method of getting the deposit of platinum or gold may possibly find use also in decorating chinaware. If the solution is applied with a brush, a quill, or a glass stylus, it may be more dilute. The same method applied to silica wares also gives very satisfactory results.

APPLICATION OF CHINA COLORS BY USE OF RUBBER STAMPS.

Paints mixed in oil are not satisfactory for use with rubber stamps because the type leaves on the porcelain a rim of thickened paint while the main surface of contact is relatively bare. The method finally adopted is to stamp the wares to be marked with a sizing or varnish similar to that which painters use for applying gold leaf. "Fat oil"—i. e., partly oxidized linseed oil, supplied by paint dealers—proved very satisfactory for this purpose. While this sizing is still sticky, the dry pigment is dusted on with a camel's-hair brush. After the varnish has set the excess of pigment is wiped off and the crucible is fired at a strong red heat, preferably in a muffle. The "fat oil" dries slowly. This is an advantage because then some time may be allowed between its application and the dusting on of the pigment for the irregular layer on the porcelain to draw out by surface tension into a smoother one. Standing overnight at room temperature, or for one hour in a drying oven at 100° C., suffices for the varnish to set. The pad used for "inking" the type may consist of several thicknesses of linen cloth and is nearly saturated with this varnish. Too much varnish on the pad must be avoided, as it results in figures with ragged outlines. This varnish may readily be cleaned from the rubber type before it has set by use of a 10 per cent alcoholic solution of caustic potash applied with a small bristle brush.

COLOR TESTS.

Seeking a prominent color and one resistant to both acids and alkalis, a series of tests was made with samples of overglaze blues, blacks, and reds supplied by a dealer and one blue prepared by the writer. These were stamped onto porcelain crucibles as above described. The heat used in firing was a red heat slightly lower than that at which the colored figures on the white background disappeared (the radiation plus reflection from a colored surface equaling that from a white surface). In one test they were brought from a dull red to the above temperature during the course of one hour and then cooled. This sufficed to make the blacks and the reds resistant to nitric acid (35 per cent) and to sodium-hydroxid solution (10 per cent), but the blues were appreciably soluble in the acid. To make the blues resistant, they had to be fired to a higher temperature or held at the above maximum temperature for about an hour. To test the permanence of the markings, the acid and the alkali were each applied five minutes cold, followed by five minutes at a boiling temperature. Of the seven blacks tried, two—viz, a lettering black and a blue black—gave especially good effects in that they yielded a very strong black. Of the same samples when applied to silica dishes and fired as indicated both the blacks and the reds were again resistant to both nitric acid and alkali, but the blues, even when fired more strongly, came off very readily in nitric acid.

In these tests an electric muffle was used. In heating porcelain crucibles to a high temperature in gas muffles in which the muffle chambers were not thoroughly sealed off from the gas chambers, and occasionally also in the electric muffle, a brown stain developed on the porcelain. This could readily be removed by heating the crucible half a minute in the blast flame, most conveniently in a suitable chimney.

In applying the rubber stamp to the crucibles it is difficult to avoid a sliding motion that blurs the imprint. This may be prevented by using a suitable guide or a steadying support. The writer found it convenient to rest both the inverted crucible and the type holder on a smooth surface while making the impression. In numbering crucibles, etc., it is often advantageous to have the number on three sides so as to make it visible, no matter which way the crucible is turned.

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